W3-P1

In[1]:=
```
Limit[((2 (x + Δx)^2 + 3 (x + Δx) + 4) - (2 x^2 + 3 x + 4))/Δx, Δx → 0]
```

Out[1]=
$$3 + 4\,x$$

In[2]:=
```
Limit[((x + Δx)^4 - x^4)/Δx, Δx → 0]
```

Out[2]=
$$4\,x^3$$

W3-P2

In[3]:=
```
D[x^3, x]
```

Out[3]=
$$3\,x^2$$

In[4]:=
```
D[x^(5/4), x]
```

Out[4]=
$$\frac{5\,x^{1/4}}{4}$$

In[5]:=
```
D[x^(1/3), x]
```

Out[5]=
$$\frac{1}{3\,x^{2/3}}$$

In[6]:=
```
D[1 - 2 x + 3 x^2 - 4 x^3 + 5 Sin[x] - 6 Cos[x] + 7 Exp[x] - 8 Log[x], x]
```

Out[6]=
$$-2 + 7\,e^x - \frac{8}{x} + 6\,x - 12\,x^2 + 5\,\text{Cos}[x] + 6\,\text{Sin}[x]$$

W3-P3

In[7]:=
```
D[(n R T)/V (1 - (n B)/V), V]
```

Out[7]=
$$\frac{B\,n^2\,R\,T}{V^3} - \frac{n\,R\,T\left(1 - \frac{B\,n}{V}\right)}{V^2}$$

W3-P4

In[8]:=
```
D[(1 - 4 x^2) Cos[x], x]
```

Out[8]=
$$-8\,x\,\text{Cos}[x] - (1 - 4\,x^2)\,\text{Sin}[x]$$

In[9]:=
```
D[(2 + 3 x) Exp[x], x]
```

Out[9]=
$$3\,e^x + e^x\,(2 + 3\,x)$$

In[10]:=
```
D[Exp[x] Cos[x], x]
```

Out[10]=
$$e^x\,\text{Cos}[x] - e^x\,\text{Sin}[x]$$

In[11]:=
```
D[x Log[x], x]
```

Out[11]=
$$1 + \text{Log}[x]$$

In[12]:= `D[(1 + x)^5, x]`

Out[12]= $5\ (1+x)^4$

In[13]:= `D[Sqrt[2 + x^2], x]`

Out[13]= $\frac{x}{\sqrt{2+x^2}}$

In[14]:= `D[Exp[-2 x], x]`

Out[14]= $-2\ e^{-2x}$

In[15]:= `D[Cos[2 x^2 - 3 x + 1], x]`

Out[15]= $-(-3+4x)\ \text{Sin}[1-3x+2x^2]$

In[16]:= `D[Exp[Sin[x]], x]`

Out[16]= $e^{\text{Sin}[x]}\ \text{Cos}[x]$

In[17]:= `D[Log[(2 + x)/(3 - x)], x]`

Out[17]= $\frac{(3-x)\left(\frac{1}{3-x}+\frac{2+x}{(3-x)^2}\right)}{2+x}$

In[18]:= `D[Log[Sin[2 x] + Sin[x]^2], x]`

Out[18]= $\frac{2\ \text{Cos}[2x]+2\ \text{Cos}[x]\ \text{Sin}[x]}{\text{Sin}[x]^2+\text{Sin}[2x]}$

In[19]:= `D[Tan[4 x] Cos[2 x]^2, x]`

Out[19]= $4\ \text{Cos}[2x]^2\ \text{Sec}[4x]^2-4\ \text{Cos}[2x]\ \text{Sin}[2x]\ \text{Tan}[4x]$

In[20]:= `D[x^2 Exp[2 x^2 + 3], x]`

Out[20]= $2\ e^{3+2x^2}\ x+4\ e^{3+2x^2}\ x^3$

W3-P5

In[21]:= `D[2 x^2 - y^2, x]`

Out[21]= $4x$

In[22]:= `D[2 x^2 - y^2, y]`

Out[22]= $-2y$

In[23]:= `D[Sin[x^2 - y^2], x]`

Out[23]= $2x\ \text{Cos}[x^2-y^2]$

In[24]:= `D[Sin[x^2 - y^2], y]`

Out[24]= $-2y\ \text{Cos}[x^2-y^2]$

W3-P6a

In[25]:=
```
D[x^2 - 3 x^2 y + 4 x y^2, x]
D[x^2 - 3 x^2 y + 4 x y^2, y]
```

Out[25]= $2\,x - 6\,x\,y + 4\,y^2$

Out[26]= $-3\,x^2 + 8\,x\,y$

In[27]:=
```
D[x^2 - 3 x^2 y + 4 x y^2, x, x]
D[x^2 - 3 x^2 y + 4 x y^2, x, y]
D[x^2 - 3 x^2 y + 4 x y^2, y, y]
```

Out[27]= $2 - 6\,y$

Out[28]= $-6\,x + 8\,y$

Out[29]= $8\,x$

In[30]:=
```
D[x^2 - 3 x^2 y + 4 x y^2, x, x, y]
D[x^2 - 3 x^2 y + 4 x y^2, x, y, y]
```

Out[30]= -6

Out[31]= 8

W3-P6b

In[32]:=
```
D[3 x^2 + y^2 + 2 x y^2, x]
D[3 x^2 + y^2 + 2 x y^2, y]
```

Out[32]= $6\,x + 2\,y^2$

Out[33]= $2\,y + 4\,x\,y$

In[34]:=
```
D[3 x^2 + y^2 + 2 x y^2, x, x]
D[3 x^2 + y^2 + 2 x y^2, x, y]
D[3 x^2 + y^2 + 2 x y^2, y, y]
```

Out[34]= 6

Out[35]= $4\,y$

Out[36]= $2 + 4\,x$

In[37]:=
```
D[3 x^2 + y^2 + 2 x y^2, x, y, y]
```

Out[37]= 4

W3-P7

In[38]:=
```
D[2 x^2 y + Cos[x + y], x]
D[2 x^2 y + Cos[x + y], y]
```

Out[38]= $4\,x\,y - \text{Sin}[x + y]$

Out[39]= $2\,x^2 - \text{Sin}[x + y]$

In[40]:=
```
D[2 x^2 y + Cos[x + y], x, x]
D[2 x^2 y + Cos[x + y], x, y]
D[2 x^2 y + Cos[x + y], y, y]
```

Out[40]= $4\,y - \text{Cos}[x + y]$

Out[41]= $4\,x - \text{Cos}[x + y]$

Out[42]= $-\text{Cos}[x + y]$

W3-P8

In[43]:=
```
D[x^3 - 3 x^2 y + y^3, x, y]
D[x^3 - 3 x^2 y + y^3, y, x]
```

Out[43]= $-6\,x$

Out[44]= $-6\,x$

In[45]:=
```
D[x^2 Cos[y - x], x, y]
D[x^2 Cos[y - x], y, x]
```

Out[45]= $x^2\,\text{Cos}[x - y] + 2\,x\,\text{Sin}[x - y]$

Out[46]= $x^2\,\text{Cos}[x - y] + 2\,x\,\text{Sin}[x - y]$

W3-P9

In[47]:=
```
D[Cos[x + 2 y + 3 z], x, y, z]
D[Cos[x + 2 y + 3 z], y, z, x]
D[Cos[x + 2 y + 3 z], z, x, y]
```

Out[47]= $6\,\text{Sin}[x + 2\,y + 3\,z]$

Out[48]= $6\,\text{Sin}[x + 2\,y + 3\,z]$

Out[49]= $6\,\text{Sin}[x + 2\,y + 3\,z]$

W3-P10

In[50]:=
```
D[f[x - c t] + g[x + c t], x, x]
1/c^2 D[f[x - c t] + g[x + c t], t, t] // Simplify
```

Out[50]= $f''[-c\,t + x] + g''[c\,t + x]$

Out[51]= $f''[-c\,t + x] + g''[c\,t + x]$